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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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James Economy

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EVAN LAW GROUP LLC
600 WEST JACKSON BLVD., SUITE 625
CHICAGO, IL 60661

EXAMINER

HUSON, MONICA ANNE

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/717,303	Applicant(s) ECONOMY ET AL.	
	Examiner Monica A. Huson	Art Unit 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 February 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5-10,18-24,28,30,31 and 38-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-10,18-24,28,30,31 and 38-42 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 June 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This office action is in response to the Amendment filed 22 February 2008.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3, 5-13, 18-19, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Economy *et al.* (US Patent No. 5,399,377) in view of Mitchell *et al.* (US Patent No. 4,396,663) and in further view of Economy *et al.* (U.S. Patent 4,075,276).

Economy *et al.* ('377) teach the basic claimed process of making a composite material including, providing a borazine oligomer, providing reinforcing fibers (unidirectional aligned fibers or fabric preform) and mixing said borazine oligomer with said fibers to form a mixture in a mold, heating said mixture at a temperature of 50-90 °C (first heating) for a time of 48 hours (first heating), further heating said mixture up to a maximum temperature of 400 °C (second heating), where the molding pressures throughout the process were gradually increased to a maximum pressure of 5 ksi (34 MPa) (at least 15 MPa) and applying a third heating at 1200 °C (see col. 3, lines 31-51; col. 4, lines 5-56; col. 7, lines 20-21 and col. 8, lines 64-66).

Regarding claims 1-2, although Economy *et al.* ('377) teach in general to apply heat and pressure (see col. 3, lines 31-40), Economy *et al.* ('377) do not specifically teach applying a pressure of at least 1 MPa during the first heating. However, Mitchell *et al.*, hereafter "Mitchell," shows that a method including the following is known: (1) impregnating the preform, (2) applying a pressure of 350 psi (greater than 1 MPa) during the first heating (see col. 10, lines 7-20). Therefore, it would have been obvious for one of ordinary skill in the art to provide a pressure of 350 psi as taught by Mitchell during the first heating in the process of Economy *et al.* ('377) in order to form the desired density product in stages instead of all at once, risking injury to the molded article. Further, it is noted that Economy *et al.* ('377) specifically teach that during the first heating the preform is "partially stabilized" (see col. 4, lines 32-35), thereby suggesting the pressure of Mitchell that results in a "pre-rigidized" preform. It is submitted that a "partially stabilized" preform is a "pre-rigidized" preform.

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Further regarding claims 1-2, although Economy *et al.* ('377) in view of Mitchell teach a boron nitride matrix composite having a density of 1.61 g/cm^3 , Economy *et al.* ('377) in view of Mitchell do not teach a boron nitride matrix composite having a density of at least 1.62 g/cm^3 . Economy *et al.*, hereafter "Economy '276," shows that higher pressure clearly yield higher density products (Column 9, lines 31-34; note that Economy '276 shows a product having a density of 1.85 g/cc at Column 10, lines 33-34). Since Economy '377 shows a higher pressure range including the lowest pressure which is claimed, it would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to form a higher density product, such as that which is claimed, during Economy '377's process because Economy '276 clearly shows that a higher pressure will yield a higher density product.

In regard to claim 3, Economy *et al.* ('377) teach heating a borazine oligomer at 70°C for 30-35 hours (see col. 3, line 66 through col. 4, line 19).

Regarding claim 8, Economy *et al.* ('377) teach a heating rate during the second heating of 30°C/hr. (0.5°C/min) (see col. 4, line 40).

In regard to claims 5-7 and 9-13, Economy *et al.* ('377) teach heating said mixture at a temperature of $50-90^\circ\text{C}$ (first heating temperature) for a time of 48 hours (first heating time), further heating said mixture up to a maximum temperature of 400°C (second heating temperature) using a heating rate of 30°C/hr. (0.5°C/min) (second heating rate), where the molding pressures throughout the process (first and second pressure) were gradually increased to a maximum pressure of 5 ksi (34 MPa) (at least 15 MPa) (first and second pressure) applying a third heating at 1200°C (third heating temperature) (see col. 3, lines 31-51; col. 4, lines 5-56; col. 7, lines 20-21 and col. 8, lines 64-66). It is submitted that the first heating temperature, the first heating time, the second heating temperature, the second heating rate and the first and second pressure are result effective variables. In re Antonie, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). Therefore, it would have been obvious for one of ordinary skill in the art to have used routine experimentation to determine an optimum level for the first heating temperature, the first heating time, the second heating temperature, the second heating rate and the first and second pressure in the process of Economy *et al.* ('377) because Economy *et al.* ('377) teaches specific values for said process parameters, hence teaching that said process parameters are result-effective variables.

Specifically regarding claim 18, Economy '377 shows the process as claimed as discussed in the rejection of Claim 1 above, but he does not show a boron nitride matrix composite having a density of over 1.8 g/cm^3 . Economy '276 shows that higher pressures clearly yield higher density products (Column 9, lines 31-34; note that Economy '276 shows a product having a density of 1.85 g/cc at Column 10, lines 33-34). Since Economy '377 shows a higher pressure range including the lowest pressure which is claimed, it would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to form a higher density product, such as that which is claimed, during Economy '377's process because Economy '276 clearly shows that a higher pressure will yield a higher density product.

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Regarding claim 19, although Economy *et al.* ('377) does not specifically teach the properties of the resulting composite material, it is submitted that, because Economy *et al.* ('377) in view of Mitchell and in further view of Economy '276 teach the claimed materials (borazine oligomer and carbon fibers), the claimed manufacturing process steps, and the claimed density, then the resulting composite material will also possess the claimed properties.

Regarding Claim 40, Economy '377 shows the process as claimed as discussed in the rejection of Claim 2 above, including a method wherein the mixture is heated a fourth time to at temperature of at least 1200C (Column 4, lines 48-52).

3. Claims 20-22, 28, 31, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Economy *et al.* (US Patent No. 5,399,377) in view of in view of Mitchell, and in further view of Economy '276, and Lavasserie *et al.* (US 2003/0136502 A1).

Economy *et al.* ('377) in view of Mitchell and Economy '276 teach the basic claimed process as described above.

Regarding claim 20, although Economy *et al.* ('377) teach a three dimensional carbon fiber preform (see col. 7, line 21 and col. 8, lines 64-66), Economy *et al.* ('377) does not teach a needled carbon fiber preform. However, needling a fiber preform prior to forming a ceramic matrix composite is well known as evidenced by Lavasserie *et al.* (US 2003/0136502 A1) who teach that it is well known when making a ceramic matrix composite to use a needled preform (see para. [0010]). Therefore, it would have been obvious for one of ordinary skill in the art to have provided a needled preform as taught by Lavasserie *et al.* (US 2003/0136502 A1) in the process of Economy *et al.* ('377) because of known advantages such as improved handleability that allows densification without the need of support tooling, hence providing for a simplified process and also because of its well known status.

In regard to claim 21, Economy *et al.* ('377) teach applying a third heating at 1200 °C (see col. 3, lines 31-51; col. 4, lines 5-56; col. 7, lines 20-21 and col. 8, lines 64-66).

Specifically regarding claim 22, Economy *et al.* ('377) teach heating a borazine oligomer at 70 °C for 30-35 hours (see col. 3, line 66 through col. 4, line 19).

Regarding claim 28, Economy '377 shows the process as claimed as discussed in the rejection of Claim 20, but he does not show a boron nitride matrix composite having a density of over 1.8 g/cm³. Economy '276 shows that higher pressures clearly yield higher density products (Column 9, lines 31-34; note that Economy '276 shows a product having a density of 1.85 g/cc at Column 10, lines 33-34). Since Economy '377 shows a higher pressure range including the lowest pressure which is claimed, it would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to form a higher density product, such as that which is claimed, during Economy '377's process because Economy '276 clearly shows that a higher pressure will yield a higher density product.

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Regarding claim 31, although Economy *et al.* ('377) in view of Mitchell and in further view of Economy '276 and Lavasserie *et al.* (US 2003/0136502 A1) do not specifically teach the properties of the resulting composite material, it is submitted that, because Economy *et al.* ('377) in view of Mitchell and in further view of Economy '276 and Lavasserie *et al.* (US 2003/0136502 A1) teach the claimed materials (borazine oligomer and carbon fibers), the claimed manufacturing process steps, and the claimed density, then the resulting composite material will also possess the claimed properties.

Regarding Claim 41, Economy '377 shows the process as claimed as discussed in the rejection of Claim 20 above, including a method wherein the mixture is heated a fourth time to at temperature of at least 1200C (Column 4, lines 48-52).

4. Claim 24, 30, 38-39, and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Economy *et al.* (US Patent No. 5,399,377) in view of in view of Mitchell, and in further view of Economy '276, Lavasserie *et al.* (US 2003/0136502 A1) and Parlier *et al.* (US Patent No. 6,284,358 B1).

Economy *et al.* ('377) in view of Mitchell and in further view of Economy '276 and Lavasserie *et al.* (US 2003/0136502 A1) teach the basic claimed process as described above.

Regarding claim 24, although Economy *et al.* ('377) in view of Mitchell and in further view of Economy '276 and Lavasserie *et al.* (US 2003/0136502 A1) teach a three dimensional carbon fiber needled preform, Economy *et al.* ('377) in view of Mitchell and in further view of Economy '276 and Lavasserie *et al.* (US 2003/0136502 A1) do not teach a needled CVI-infiltrated carbon fiber preform. However, CVI consolidation of a fiber preform prior to forming a ceramic matrix composite is well known as evidenced by Parlier *et al.* ('358) who teach that it is well known when making a ceramic matrix composite to use a CVI consolidated preform prior to densification of said preform (see col. 1, lines 23-35 and col. 3, lines 42-60). Therefore, it would have been obvious for one of ordinary skill in the art to have used a CVI infiltration process as taught by Parlier *et al.* ('358) to further consolidate the needled carbon fiber preform in the process of Economy *et al.* ('377) in view of Mitchell and in further view of Economy '276 and Lavasserie *et al.* (US 2003/0136502 A1) because of known advantages such as improved handleability that allows densification without the need of support tooling, hence providing for a simplified process and also because of its well known status.

In regard to claim 30, Economy '377 shows the process as claimed as discussed in the rejection of Claim 1 above, but he does not show a boron nitride matrix composite having a density of over 1.8 g/cm³. Economy '276 shows that higher pressures clearly yield higher density products (Column 9, lines 31-34; note that Economy '276 shows a product having a density of 1.85 g/cc at Column 10, lines 33-34). Since Economy '377 shows a higher pressure range including the lowest pressure which is claimed, it would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to form a higher density product, such as that which is claimed, during Economy '377's process because Economy '276 clearly shows that a higher pressure will yield a higher density product.

Specifically regarding claim 38, Economy *et al.* ('377) teach applying a third heating at 1200 °C (see col. 3, lines 31-51; col. 4, lines 5-56; col. 7, lines 20-21 and col. 8, lines 64-66).

Regarding claim 39, Economy *et al.* ('377) teach heating a borazine oligomer at 70 °C for 30-35 hours (see col. 3, line 66 through col. 4, line 19).

Regarding Claim 42, Economy '377 shows the process as claimed as discussed in the rejection of Claim 38 above, including a method wherein the mixture is heated a fourth time to at temperature of at least 1200C (Column 4, lines 48-52).

Response to Arguments

Applicant's arguments with respect to the pending claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica A. Huson whose telephone number is 571-272-1198. The examiner can normally be reached on Monday-Friday 7:00am-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on 571-272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Monica A Huson
Primary Examiner
Art Unit 1791

/Monica A Huson/
Primary Examiner, Art Unit 1791